EVALUATION OF TWO VISUAL PRESENTATIONS OF A TRAINING PROGRAM FOR FOOD SERVICE WORKERS

by

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INTRODUCTION

Approximately one-fourth of the meals consumed in the United States are eaten away from home, and indications are that this number will increase. A growing population, more money to spend, an increase in travel, and expanded school and factory feeding programs were important factors in bringing about this growth.

Labor cost and productivity will continue to be the chief problems of the food industry. Higher wages paid to employees who have fewer skills than did those of yesterday emphasize the importance of training. The food service industry employs more people than does any other industry in the nation. Greenaway (1964) estimated that the industry will create 75,000 new jobs and will need 150,000 replacements each year. These new employees will need to be trained.

Employee training in the past has depended largely upon availability of qualified supervisory personnel who could devote time to training. At present, however, many food service managers and supervisors are too involved in supervision of food production and other management duties to train employees adequately. Many institutions not only lack personnel to assume the responsibility for training employees, but lack time even to prepare a training program. Food service managers and supervisors who have time to train employees may not necessarily be good teachers. This statement is not a criticism of the ability of food service managers or supervisors because no one can be an expert in all areas.

For a considerable time, the food service industry has needed detailed, practical training procedures that unskilled workers can understand. Programmed instruction, in which material is presented in a series of small steps that can be easily understood by any trainee, is a possible solution to this problem. Hoelscher (1966) reported that such material has been successfully tested in other industries and finally is being created for food services. However, only a few programs are presently available for use by the food service industry.

One of the most critical and time-consuming operations performed in the institutional kitchen is dishwashing which, in most large food services, is done by machine. The dishwashing machine is composed of a series of complex components, all working together for efficient results. A minor malfunction of one small part can stop the entire operation. Personnel employed in the dishwashing operation usually are unskilled and have limited educational background and often are untrained. At many institutions the entry job is dishwashing, and the total length of time on this job often is less than one week. Furthermore, most dishwashing problems are attributable to improper training.

The purpose of this study was first, to develop two visual instructional methods for training employees in one phase of a machine dishwashing procedure; and second, to evaluate and compare the effectiveness of the two training methods.

REVIEW OF LITERATURE

Employee Training

The food service industry labor force increased 30% from 1947 to 1963 in spite of greater use of labor-saving devices during that period (Weeksler, 1965). Furthermore, Weeksler (1967) believes that a continued expansion of the food service market will cause an even greater increase in this percentage.

Competent people are not entering food service, according to Warner (1963) and Weeksler (1967). Under present training conditions, Greenaway (1964) observed that a completely untrained, unindoctrinated food service employee develops rather slowly because of the multitude of details involved in the job. Training time varies from a few days to a week, depending on the position and the trainee.

In a growing industry that employs many unskilled workers, it is apparent that a critical need for employee training exists. The food service field has not met this training need. Hughes and McNamara (1961b) cited four reasons for this:

1. The food service industry always has suffered from a shortage of qualified instructors. Traditionally, the supervisor is highly skilled but has had no formal training in education. As a result, he frequently makes mistakes in educational techniques that would be quickly recognized by professional educators.

2. The trainer lacks time to prepare materials. Either he is training employees on a part-time basis, or he has a much heavier load than that of his academic counterpart.

3. It often is impossible to get enough trainees together to justify the expense of conducting a training course, and employees who need instruction may therefore have to wait for some time before a class can be formed.

4. Employees needing to be trained may be working in widely scattered locations, and this situation makes instruction difficult.

Programmed Instruction

A relatively new method of instruction that promises to be of considerable assistance in furnishing rapid and economical training for the food service is programmed instruction. Hughes and McNamara (1961b) and Carter et al. (1964) agreed that programmed instruction may be a possible solution for food service training problems.

Programmed instruction, according to the Joint Committee on Programmed Instruction and Teaching Machines (1966), is a method of teaching that is essentially self-instructional. Lumsdaine (1962) and Thomas et al. (1963) agree that it requires active participation by the learner, who profits by obtaining the correct answers immediately. He can proceed at his own pace, and he learns through constant repetition and evaluation of his own progress in relation to the entire program. Williams (1963) and Christian (1962) described programming as the process of arranging the material to be learned in a series of small steps designed to lead a student through self instruction from what he knows to the unknown of new knowledge. Such a program commonly attempts

to provide conditions under which a student can learn something efficiently with little or no outside help. Programmed instruction is a particularly useful tool in that it enables meaningful materials to be taught under controlled conditions (Lumsdaine, 1962).

Construction of an effective program demands intelligence, verbal ability, imagination, a thorough knowledge of the subject, and knowledge of how to write programs. Writing the program is the most demanding part of the technique. Deterline (1962), Margulies et al. (1962), along with Lysaught and Williams (1963), indicated that a program should be tested and retested by having students use the programs. After each use, the program should be revised and modified on the basis of the students' responses and achievement. Only after the program has undergone thorough and rigorous testing and revision can the instructor be confident that the program accomplishes its objectives.

Thomas et al. (1963) stated that, although no single development in training presently holds as much promise as programmed instruction, there is a need for highly qualified programmers. Much of the material written for programming, according to Glasser (1966), is prepared by professionals with little, if any, background in the psychology of learning. The most important outcome of the programmed instruction movement is the systematized attempt to prepare objectives and then teach in terms of these same objectives.

There are basically two kinds of programming: branching and linear. The branching program, according to Pipe (1966),

typically presents much more information at each step than does the linear program. A branching step may consist of two or three paragraphs with multiple-choice questions at the end of each frame, and the succeeding frame depends upon the student's answer. A linear program commonly gives a sentence or two at a time, and the succeeding frame does not depend on the student's response.

Cram (1961) stated that linear programming is appropriate for areas dealing mainly with facts and definitions. Branching is best used in the area beyond facts, definitions, and basic skills.

In programmed instruction, students work individually. Because of the differences in education, experience, aptitude, and motivation of the students, the speed with which individuals complete programs varies widely. These differences, according to Hughes (1962), constitute one of the main advantages of programmed learning. The bright student can proceed through the material quickly and the slow student can take the additional time needed to acquire an understanding of the subject.

Programming Costs. Programming costs are hard to estimate, according to Christian (1962). The estimates varied from three to five eight-hour days to produce the equivalent of a one-hour lecture. One firm found that if time for program testing was included, writing one frame took from 30 to 60 minutes, depending on the subject matter. Dahle (1954), who studied five methods of presenting information to employees, found that the least expensive way may not be the most effective and in the long run, may actually prove more costly in terms of time wasted and production lost.

Comparison with Other Techniques. Christian (1962) cited several business firms using programmed instruction who claimed improved performance and a savings of time in comparison with conventional training. They found that quality of training no longer varied with the ability of instructors, and that trainees' mastery of material was higher than that achieved by use of conventional methods.

Hughes and McNamara (1961) compared the learning achievement of employee classes taught by programmed instruction in the form of programmed textbooks with that of classes taught by conventional classroom instruction. Results indicated a reduction in training time and improvement in learning achievement through the use of programmed instruction. However, some trainees expressed boredom with too much repetition and page turning. Overuse of programmed textbooks for training without breaks for class discussion, laboratory, or other instructor contact at intervals would, in their opinion, become boring. They suggested programmed instruction as a supplement to existing educational procedures rather than as a replacement of them. Although there are individual differences among students in the amount of programmed instruction they can take effectively at one session, Hughes (1962) commented that two or three hours appears to be reasonable at the onset.

Goldberg (1964) compared two different methods of instruction (textbook and teaching machine) with each other and with the conventional classroom method in terms of both immediate and delayed recall, the time required to learn, and the trainees'

attitudes toward the instructional methods. The most evident advantage was in helping the slower learners to obtain a direct familiarity with the course material; however, the conventional classroom method proved best to teach practical problem solving skills to relatively rapid learners. Programmed instruction, in this study, did not provide good training for recall.

Although programmed instruction in Goldberg's study had the greatest degree of initial interest, this declined over the three-week period. Interest in conventional classroom method increased as the course progressed.

Roe (1962) compared results obtained in use of a multiple choice teaching machine, of free response teaching machines in individual booths, of free response teaching machines in a classroom, of programmed textbooks requiring no overt responses, of "program" lectures and of standard lectures. He found no significant differences between any of the programmed instruction methods, but all learning acquired with programmed instruction was significantly better than that acquired in the standard lecture.

Media for Presentation of Training Material

Ample evidence was shown by Margulies and Eigen (1962) that pictorial representation of stimulus objects can lead to high positive transfer under certain conditions. There is little loss of transfer if one learns from pictures rather than the real object. This concept of stimulus similarity and also the verbal components of a skill could be presented by use of teaching

machines, and since the aim is to maintain associations that already have been learned, the transfer should be high.

In presenting information, the assumption is often made, according to Stewart (1965), that the trainee perceives information in the same manner and in the same degree as the instructor. This assumption is especially questionable in regard to verbal information. For some reason, many believe that words have meaning. Words do not have meaning; however, people have meanings for these symbols referred to as words and these meanings vary greatly because each person has had a unique combination of experiences. Meanings may be highly personal, or they may, in many instances, be almost coincident with the meanings held by other people.

Experts in the audio-visual field, according to Stewart (1965), have indicated that about 80% of learning is acquired through the eyes, 11% through the ears, and the balance through the other three senses. Because of the importance of the eyes, it is of value to evaluate the validity of what is seen.

Konz et al. (1966) compared the efficiency of presenting work instruction through slides, typed lists, and audio media. The audio medium appeared in general to be the poorest method of communicating work instruction, and the pictorial slide presentation was best. In between the extremes was the traditional typed list, being fairly poor in both time required and errors made by the trainee.

Visualization, asserted Konz et al. (1964), also seems to be an important consideration. If a subject used a picture, he

merely looked at it and matched what he saw with what he had assembled. When using a list, he had to decode the written words and form a mental picture to use for comparison with his actual assembly. Audio instruction requires a good memory in addition to visualization. Audio also seems to act as a pacing device, with the subject improving only up to the pace of the tape and then maintaining this pace.

When using pictures, stated Konz et al. (1964), there seems to be an information content per message effect; that is, too much information may be presented in the use of a picture. More slides for a given amount of information means that the subject has less searching and interpreting to do. Fewer slides for a given amount of information means less indexing time between slides and possibly better referability, since more information is available for reference, and, of course, there are fewer slides.

Roshal (1961) stated that for an elementary task it is necessary to present only a good picture of the object acted upon, and the learner can readily supply the necessary movements from his repertoire. Simple drawings or photographs were favored by Holding (1965) as being the most effective; the more words that were added, the less effective was the slide. Simplicity is to be encouraged; photographic slides are often easier on the eye; plain use of color helps.

Demonstration pictures should be taken over the shoulder of the demonstrator, remarked Roshal (1961), to maximize the similarity between demonstration of perception and to minimize any

distracting effects of the demonstrator. The face of the demonstrator should never be seen.

Roshal (1961) found, in a knot tying experiment, that when the subject tied the knot at the same time as motion pictures were being shown, the divided attention seemed to produce conflict. He mentioned also that most of the subjects did not complete tying the knot during the filmed instruction. There was only limited support for the expectation that these film presentations would be more effective when an attempt was made to be certain that the learner practiced responses approaching those involved in the actual performance of the act. Techniques should be developed to foster more effective learner-participation during film-viewing.

Christian (1962) stated that when using a test it is not the employee who is being evaluated, but the program. If the employee didn't master the material, the program is faulty.

Altmaier (1965) suggested that as the trainee works on his programmed instruction course, an instructor or administrator not be present. The presence of an instructor is actually a distraction to many men. They will stop work on their course and engage the instructor in discussions that are not pertinent to the course content. It is of value to have an administrator or instructor in a nearby office, available to the trainee if real difficulty arises.

Each trainee should take a test to measure the extent of learning shortly after completion of the pertinent instruction (Altmaier, 1965). This test may be a day or so later, but should

not be much longer. There is no good way to measure longer retention. If a test is given six months or so later, many things will have happened to the man during that period that will affect the test results, but which have nothing to do with the programmed instruction. A test shortly after completion of programmed instruction indicates the effectiveness of the instruction.

Programmed Instruction in Food Service

One of the first uses of programming devices in the food service was a branching type program on a teaching machine used by McDonald and Kaufman (1963) to instruct diabetic patients. In this preliminary study, the teaching machine was found to be an effective instrument for instructing patients.

Carter et al. (1964), using a teaching machine, reported that a statistically significant amount of learning occurred in an experimental group of unskilled food service workers and that it was retained for at least one week. The wide range of age, level of education, reading level, and knowledge of the subjects represented in this experimental group suggests the general applicability of programmed instruction. Subject matter included an elementary discussion of bacteriology, disease transmission, food-borne disease transmission, food-borne diseases, personal hygiene, and sanitary food handling. Study time for the entire course was estimated to be three hours.

A program to educate diabetic patients, explained Meadows (1965), was significantly improved by adding a course of programmed instruction given by individual members of a hospital

team. The purpose was to reinforce and strengthen the effectiveness of the teaching program by presenting basic information in a new and different way.

Two programs for waitresses were prepared at Kansas State University by Apley (1964). The first explained the setting of a banquet table through a series of colored slides accompanied by a tape-recorded commentary. Pictures of the table and the exact placement of napkin, knife, forks, and other appointments were shown. The second series demonstrated correct placement by a waitress of a dinner plate in front of a guest, how to serve rolls from a basket, and how to pour coffee.

A program for kitchen workers was prepared by Middleton and Konz (1965), demonstrating two different motion patterns for breading foods. In one, both hands were in motion at the same time; in the other, each hand moved in a different way. The two patterns were broken into step-by-step sequence, and slides were made to show the placement of the utensils and movements of the hands at each step. A tape-recorded commentary, explaining in detail what was involved in each step, was made, although the slides were designed to be self-explanatory. Two types of machines could be used for these audio visual programs. In one type, the viewer changes the slides and recording simultaneously by a food pedal or hand control. In the other, the slide could be automatically changed by a prerecorded signal on the tape.

Slide-sound programs on automatic, synchronized machines were used by Pope (1965). These series of slides, which lasted about 15 minutes each, were found to be of value in hiring new

employees. An example given by Pope was that of showing an applicant a recorded basic dishwashing program, which gave him an opportunity to take or leave the job. The organization thus saved the cost of hiring an employee who probably would leave the job anyway.

PROCEDURE

Development of the Program

A visual instruction program (Appendix A) for preparing a flight-type dishwashing machine for operation was developed for food service employees. A Hobart Model FT-20 (686), with three tanks and a conveyor belt that carries the washware through the machine, was used for this program (Appendix B). Instructions were presented on 35 mm color slides by an automatic slide projector.

Instructions provided by the manufacturer of the dishwashing machine were used as a basis for the program, but they were first analyzed by means of a process chart (Appendix B). The instructions were revised, incorporating changes that would simplify the procedure, and a new process chart was made.

A description of slides (Appendix B) to be included in the program was made from the revised process chart, using words that were clear, concise, and easily understood. A slide and sometimes several slides were made for each step in the procedure. In some cases, pictures were taken of an operator performing the task on the machine; for the remaining pictures, schematic

drawings were used for location of areas where the task was to be performed. The completed slides were reviewed by a panel of three faculty members from the departments of Institutional Management and Industrial Engineering. The script was rewritten and new slides were made to incorporate suggested improvements into the program. The revised series was then tested with ten subjects not included in the study and again modified in areas in which the subjects had difficulties.

Two methods were developed for presenting the program to selected employees. In method I, instruction was given in the dishroom, which gave the subject an opportunity to see the machine and try out each step while viewing the slides. Subjects in method II were instructed in a room away from the machine, and instead of trying out each procedure on the machine wrote answers in a booklet. An evaluation checklist (Appendix B) for recording instruction time, trial time, and number of errors was developed.

Selection of Subjects

Twenty trainees (ten for each method) with no dishwashing experience were chosen from current K-State Union employees (Table 1). The employees selected were those who could be used for the dishwashing position but who were stationed currently in other areas. The subjects consisted of 18 females and two males between the ages of 38 and 69. Seven had completed the twelfth grade or more in education and 13 had finished the eleventh grade or less. Within each group of ten people, six had a performance rating of "excellent" and four "very good" (Table 1), as rated by

Table 1. Characteristics of subjects.

Method of presentation	Subject No.	Employee rating[a]	Age	Education (last grade attended)
I	1	E	54	9
	2	E	55	12
	3	G	65	8
	4	E	57	12
	15	E	50	11
	16	G	65	12
	17	G	55	13
	18	E	56	13
	19	E	38	12
	20	G	42	8
II	5	G	53	8
	6	E	57	8
	7	G	61	9
	8	E	56	13
	9	E	58	12
	10	G	55	12
	11	G	61	8
	12	E	60	14
	13	E	59	10
	14	E	69	9

[a]E = Excellent.
G = Good.

the Food Service Director and the employees' immediate supervisors in their annual review. Employees were scheduled for instruction during the hours between 6:00 and 11:00 a.m. when they could be spared from their work and when the dishwashing work-load was slack.

Instruction

Method I. The subject was taken to the dishroom where he was given an explanation of the program and procedures to be

followed (Appendix B). He was instructed in the use of the automatic slide projector and was asked to view the complete slide series to familiarize himself with the program. He then viewed the pictures again, but this time he followed instructions on the slides.

The instructor then questioned him on key points of the task (Appendix B). If the subject could not answer the questions, he was sent to the projector to review the slides and "walk through" the steps suggested by the program. This procedure was repeated until the subject believed he was ready to take a test. Time in seconds from when the subject first saw the slides until he was ready to take the test was recorded.

The subject was sent to another room for five minutes so the instructor could prepare the dishwashing machine for the test, which consisted of setting up the dishwashing machine without the aid of the slides. An evaluation form was used to record the time needed to complete the series and the number and kinds of errors made while the subject was preparing the machine for use. These data were used for evaluating the effectiveness of method I presentation.

Method II. Instructions for this method were given in a separate room that was not in use. As in method I, the trainee viewed the complete program once, after instruction in the use of the automatic slide projector. As he went through the slides the second time, he was asked to complete written statements concerning each slide (Appendix A). Each statement was typed on a separate page and had a missing word or words which the subject

was to fill in as he viewed the slide. He could check for correctness by noting the answer in the right hand corner of the next page. When the program was completed, the trainee was asked the same questions as in method I. If he could not answer the questions, he was sent back to the projector to review the slides and the booklet. This procedure was repeated until the subject was able to recite the steps orally.

The time from when the subject first saw the slides until he was ready to take the test was recorded. Five minutes after completion of the training, he was taken to the dishroom and asked to set up the dishwashing machine. As in method I, an evaluation form was used to record the time needed to complete the series and the errors made while he was preparing the machine for use.

RESULTS AND DISCUSSION

Effectiveness of the two teaching methods was judged by the total number of errors made and by the number of seconds required for instruction and for a test performance.

Errors

The 76 errors for method I presentation (Table 2) were considerably less than the 125 for method II. Subjects in method I omitted 13 steps compared with 29 in method II. The 54 "out of sequence" errors in method I were slightly fewer than the 70 made in method II. All subjects using method I were able to find the

Table 2. Errors made by employees during the test.

Method of presentation	Subject No.	Steps left out	Out of order	Could not find	Performed incorrectly	Total
I	1	1	5	-	3	9
	2	2	5	-	2	9
	3	5	6	-	-	11
	4	3	9	-	2	14
	15	1	2	-	-	3
	16	-	7	-	-	7
	17	-	9	-	1	10
	18	-	9	-	-	9
	19	-	2	-	-	2
	20	1	-	-	1	2
Total		13	54	0	9	76
Mean		1.3	5.4	0.0	0.9	7.6
II	5	5	2	-	4	11
	6	5	4	3	1	13
	7	2	7	-	1	10
	8	-	2	1	3	6
	9	1	11	-	2	14
	10	1	9	1	2	13
	11	7	4	1	-	12
	12	2	14	-	2	18
	13	-	13	1	2	16
	14	6	4	1	1	12
Total		29	70	8	18	125
Mean		2.9	7.0	0.8	1.8	12.5

location of valves, buttons, and other parts cited in the program; in method II, six subjects failed to locate at least one of the valves, buttons, and parts. Procedures performed incorrectly for method I numbered 10; however, 18 errors of this type were noted in method II. Total error differences noted were significant at the 5% level with a Mann Whitney U test (Table 3).

The greatest number of errors in both methods occurred in sequence of steps. These errors may have been due to a lack of

Table 3. Mann Whitney U Test for methods I and II.

Instruction time	Test time	Errors	Critical region
50	16*	17*	Under 27

*Significant at the 5% level.

understanding of the reasons for the necessary sequences. The higher number of errors in method II may have been due to the fact that the dishwashing machine was not used during the instruction period.

Two of the 10 trainees completed method I with only two errors. One of the two subjects had an eighth grade education. Seven had 10 or fewer errors in method I, while there were only two subjects who had 10 or fewer errors in method II.

Instruction and Test Time

Instruction time in method I (Table 4) ranged for individual subjects from 2260 seconds to 4040 seconds, with a mean of 2940 seconds (49 minutes). A wider range was recorded for method II, from 1660 to 5465 seconds, averaging 3301 seconds (55 minutes). Some of these differences may have been due to difficulty experienced in operating the slide projector and number of times employees went back to the projector. A non-significant difference at the 5% level was shown by the Mann Whitney U test between the two methods for instruction (Table 3).

Table 4. Instruction and test time.

Method of presentation	Subject No.	Instruction sec.	Instruction min.	Test sec.	Test min.
	1	3815	63.6	630	10.5
	2	2280	38.0	455	7.6
	3	4040	67.3	520	8.7
	4	2705	45.1	590	9.1
I	15	2940	49.0	540	9.0
	16	4015	66.9	800	13.3
	17	2570	42.8	550	9.2
	18	2355	39.3	690	11.5
	19	2260	37.7	425	6.1
	20	2425	40.4	360	6.0
Total		29405	490.1	5560	91.0
Mean		2940.5	49.0	556.0	9.1
	5	1660	27.7	770	12.8
	6	2880	48.0	780	13.0
	7	5460	91.0	825	13.8
	8	2755	45.9	585	9.8
	9	2000	33.3	935	15.6
II	10	2505	41.2	1205	20.0
	11	4540	75.7	1545	25.8
	12	3670	61.2	1155	19.3
	13	2080	34.7	2490	41.1
	14	5465	91.1	960	16.0
Total		33015	549.8	11250	187.2
Mean		3301.5	55.0	1125.0	18.7

The number of seconds required for the test (setting up the dishwashing machine) following instruction in method I (Table 4) varied from 360 seconds to 800, with an average of 556 (9.1 minutes). In contrast to this was the mean time of 1125 seconds (18.7 minutes) in method II. Range in time for this method was wide also, with one employee completing the test in only 585 seconds (9.8 minutes), while another subject required 2490 seconds (41.5 minutes). There was a significant difference for test

time at the 5% level recorded between methods I and II with the Mann Whitney U test (Table 3).

Age, Educational Attainment, and Employee Rating

Age, educational attainment, and employee rating were analyzed for possible relationships with test results. No significant associations were found for educational attainment and employee rating.

In method I, older subjects made significantly ($P<.05$) more errors than younger subjects, as indicated by the Spearman Rank Correlation (Table 5). In method II, however, no significant difference was noted, possibly because the group was more homogeneous (age range from 53 to 69) than in method I (38 to 65).

Table 5. Spearman rank correlation between scores, instruction and test time, and each method.

	Errors		Instruction time		Test time		Critical regions
Method	I	II	I	II	I	II	Above .632 and .765
Age	.719*	.152	.558	.817**	.612	.609	
Education	-.142	.334	-.006	.137	-.382	-.112	
Rating	.182	-.209	.500	.136	.040	.173	
Errors			.364	.198	.388	.631	
Instruction time					.566	.113	

*Significant at the 5% level.
**Highly significant at the 1% level.

In method II, younger subjects had lower instruction times than older subjects, as shown by a highly significant ($P<.01$) Spearman Rank Correlation (Table 5). These findings are in agreement with Brunner (1959) and Whipple (1957) who stated that older adults learn at a slower rate than younger adults. In method I, the instruction time for younger subjects was not significantly lower than for older subjects, possibly due to the homogeneity factor.

Observations of Subjects

Trainees' pertinent remarks and reactions were recorded on the evaluation form. Some observations related to both presentations (methods I and II) and to programmed instruction follow.

Method I. Some subjects lacked confidence as to whether or not they were following directions correctly. With encouragement from the observer, they continued the program. Other subjects were worried about their regular work during instruction and test time.

Method II. A few subjects mentioned that they would like to have worked with the dishwashing machine before taking the test. Some subjects, during training, went through the slides several times and the booklet once. As in method I, many subjects worried about their work, and some lacked confidence in their ability to follow instructions.

Programmed Instruction. Most subjects could not read the signs in slides Nos. 3 and 33. Slides 17, 18, and 19, involving

the doors of the machine, caused confusion for some subjects; some questioned whether slides 10 and 21, containing pictures of the detergent dispenser and the Rinse-Dry (trade name for wetting agent) dispenser, were the same. Many subjects, during the test for both methods I and II, asked if it made any difference as to how much Rinse Dry they should pour into the dispenser. Others were confused about slides concerned with the steam valves (Nos. 23, 28, and 30).

Definite improvements would result from remaking a few of the slides in the program. However, some subjects mentioned that if they had paid more attention to the slides, they would have made fewer errors. Other subjects suggested that if they had known what to expect when going through the instruction, they would have scored higher on the test.

Change in Procedure

During the instruction period, the observer found it necessary to modify the self-instruction aspect of the training in method I. To prevent injury to trainees and to avoid damage to equipment in some instances, he stopped the trainees and referred them back to the slide program. During the test in both methods I and II, and during instruction in method I, the observer stopped the subjects and told them they were performing the step incorrectly. Instruction during method II did not need to be changed because the trainee was not working with the dishwashing machine.

Comparison of the Two Methods

Although fewer errors and lower test times were recorded for method I, it was necessary to have an instructor present. In method II, an instructor could leave a trainee during instruction time. Considering the instructor's time as cost, it is evident that method II would be more economical than method I. Furthermore, method I, which takes about an hour in the dishroom compared with about 20 minutes when using method II, could hinder the dishwashing operation and distract employees in the area for a longer time when the dishwashing machine is needed continuously.

SUMMARY

Increased labor costs, expanded use of unskilled employees, and relatively low productivity have pinpointed the need for improved training methods in the food service industry. The effectiveness of programmed instruction as a training device in other industries, has led to consideration of its use in training food service workers.

The purpose of this study was to develop two visual instruction methods for training employees in one phase of a machine dishwashing procedure and to evaluate and compare the two methods. Dishwashing was chosen because it is one of the most time-consuming operations performed in the institutional kitchen and is usually performed by unskilled employees.

A slide program of 35 mm color slides, with step-by-step instructions for preparing a flight-type dishwashing machine for

use, was developed. This program was presented on an automatic slide projector by two methods. In method I, instruction was given in the dishroom, which gave the subject the opportunity to see the machine and try out each step while viewing the slides. Subjects in method II were instructed in a room away from the machine, and instead of trying out each procedure on the machine wrote answers to questions in a booklet.

Twenty subjects from the K-State Union food service at Kansas State University were selected for instruction, 10 of which were instructed by method I and 10 by method II. Subjects of both methods were tested five minutes after instruction. Three criteria for measuring effectiveness were instruction time, test time, and number of errors.

Method I was significantly better at the 5% level than method II for both errors and test time, but there was no significant difference in instruction time. Employee attitudes were favorable toward programmed instruction in both method I and II presentations.

Method II was more self instructional than method I, which required an instructor's presence to prevent injury to subjects or damage to equipment. It can be concluded that, although method I presentation was significantly better than method II in some aspects, method II also had advantages over method I. Both presentations of programmed instruction would be applicable to training of food service personnel.

CONCLUSIONS

Evidence in this study seems to indicate the following:

1. Trainees took significantly shorter test times and made significantly fewer errors when programmed instruction was presented in the work area (method I) than when it was presented in a room away from the work area (method II).

2. Education and employee rating had no significant effect on training in either method.

3. Method II would take less instructor's time than method I.

4. Older subjects made significantly more errors than younger subjects in method I; in method II took more instruction time than younger subjects at the highly significant level.

5. Errors in sequence of steps were made by more subjects than any other error.

RECOMMENDATIONS

Method I, with improvements in presentation and addition of theory, should be considered for future studies. A cart that would house the projector and storage area for slides not in use, would facilitate transportation to areas where training is needed. Another possibility would be to have trainees view slides by themselves, in a room away from the dishroom, and then have them set up the dishwashing machine under supervision of the instructor.

Slide programs for instruction in all phases of the dish-washing machine operation should be considered for future programs. Directions for preparing washware for the machine, how to clean the machine, and how to feed washware into the machine are needed.

Slide-training programs would be of value for other pieces of equipment such as the pot-washing machine, mixing machine, vegetable cutter, deep-fat fryer, grill, and doughnut machine. Programs should be considered for counter service, vegetable preparation, salad making, baking methods, and other operations normally performed in the food service areas.

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APPENDIX A

VISUAL INSTRUCTION PROGRAM

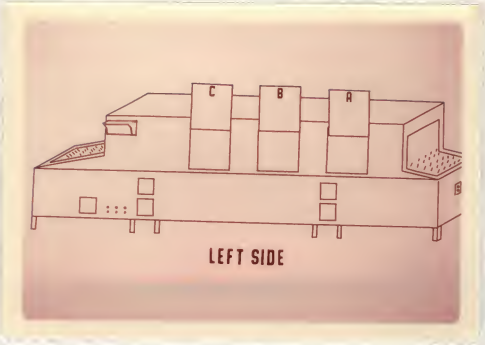
PREPARATION OF A FLIGHT-TYPE DISHWASHING MACHINE

Slide No. 1. Preparation of flight-type dishwashing machine for washing glassware, cutlery, and dishware.

Question used in booklet for Method II.

1. Preparation of a flight type _____ _____ for washing glassware, cutlery, and dishware.

Slide No. 2. Schematic drawing showing the left side of the dishwashing machine.



Question used in booklet for Method II.

2. Left _____.

Answer to question No. 1. dishwashing machine

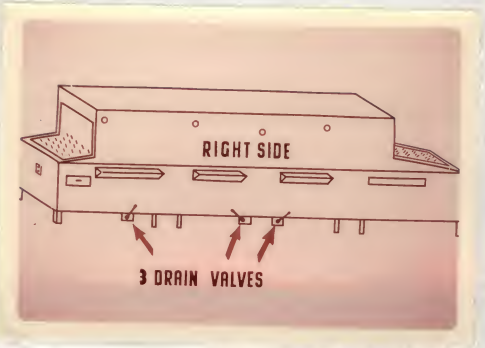
Slide No. 3. Picture of left side of the dishwashing machine and cart with curtains with bottle of rinse dry solution on it.

Question used in booklet for Method II.

3. _____ side.

Answer to question No. 2. side

Slide No. 4. Schematic of right side of dishwashing machine with arrows pointing to location of 3 drain valves.



Question used in booklet for Method II.

4. Location of three drain valves are on _____ side.

Answer to question No. 3. Left

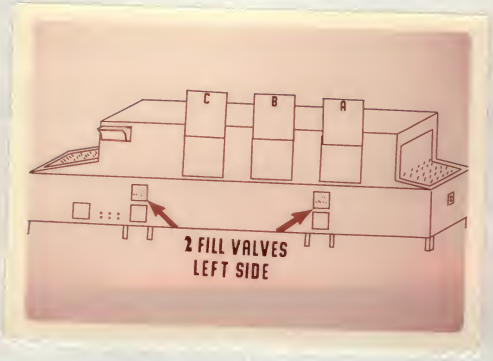
Slide No. 5. Subject in position to shut 3 drain valves.

Question used in booklet for Method II.

5. Shut _____ drain valves.

Answer to question No. 4. right

Slide No. 6. Schematic of left side of dishwashing machine with arrows pointing to location of 2 fill valves.



Question used in booklet for Method II.

6. Location of two _____ _____ are on left side.

Answer to question No. 5. 3

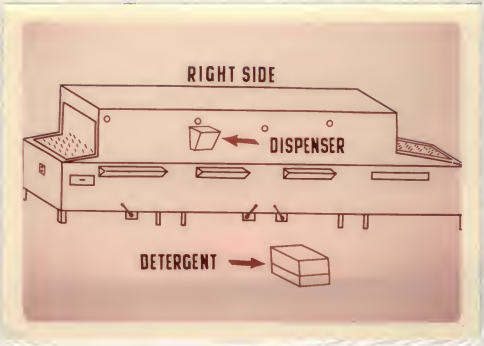
Slide No. 7. Subject in position to turn on 2 fill valves with circle arrow pointing to direction valve should be turned.

Question used in booklet for Method II.

7. Turn on _____ fill valves.

Answer to question No. 6. fill valves

Slide No. 8. Schematic of right side of dishwashing machine with arrows pointing to dispenser and detergent location.



Question used in booklet for Method II.

8. Detergent and dispenser are on the _____ side.

Answer to question No. 7. 2

Slide No. 9. Subject in position to get 3 bags detergent.

Question used in booklet for Method II.

9. Get _____ bags detergent.

Answer to question No. 8. right

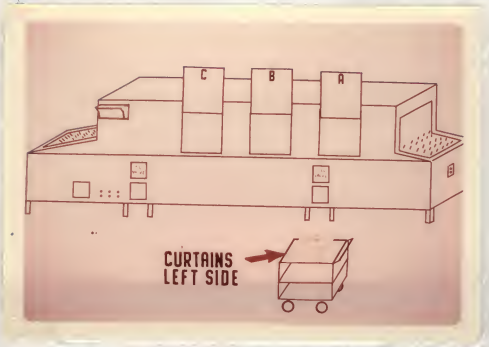
Slide No. 10. Subject ready to empty each bag in dispenser.

Question used in booklet for Method II.

10. Empty each bag in _____.

Answer to question No. 9. 3

Slide No. 11. Schematic of cart with curtains on it near the left side of the dishwashing machine.

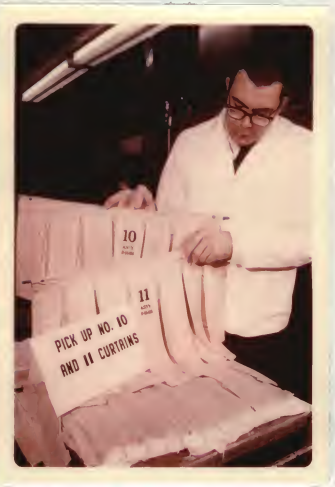


Question used in booklet for Method II.

11. Location of _____ is on left side.

Answer to question No. 10. dispenser

Slide No. 12. Subject in position to pick up No. 10 and 11 curtains.

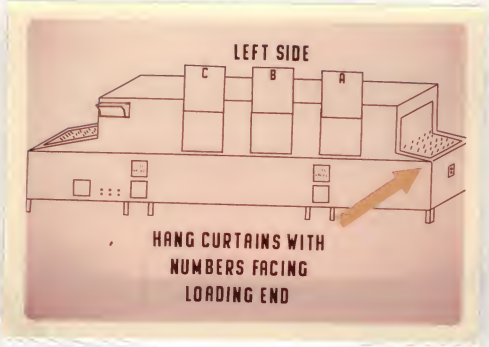


Question used in booklet for Method II.

12. Pick up No. _____ and No. _____ curtains.

Answer to question No. 11. curtains

Slide No. 13. Schematic of left side of dishwashing machine with arrow pointing to location of loading end. Sign reading, "Hang curtains with numbers facing loading end."

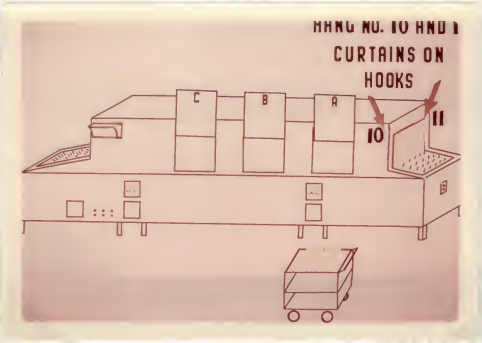


Question used in booklet for Method II.

13. Hang curtains with numbers facing _____ end.

Answer to question No. 12. 10 11

Slide No. 14. Schematic of left side of dishwashing machine with arrows pointing to the location of hooks. Sign reading "Hang No. 10 and 11 curtains on hooks."



Question used in booklet for Method II.

14. Hang No. 10 and No. 11 _____ on hooks.

Answer to question No. 13. loading

Slide No. 15. Subject in position to hang shorter curtain farthest in.

Question used in booklet for Method II.

15. Hang shorter _____ farthest in.

Answer to question No. 14. curtains

Slide No. 16. Subject ready to hang longest curtain.

Question used in booklet for Method II.

16. Hang _____ curtain.

Answer to question No. 15. curtain

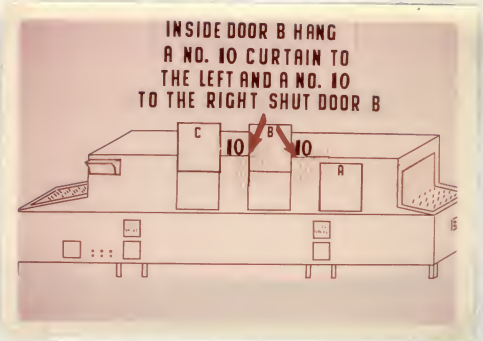
Slide No. 17. Subject in position to shut door A.

Question used in booklet for Method II.

17. Shut _____ A.

Answer to question No. 16. longest

Slide No. 18. Schematic showing left side of dishwashing machine with door A closed. Arrows pointing to location where curtains should be hung. Sign reading, "Inside door B hang a No. 10 curtain to the left and a No. 10 to the right. Shut door B."

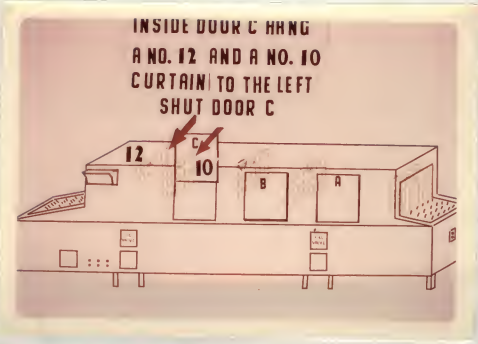


Question used in booklet for Method II.

18. Inside door B hang a No. 10 _____ to the left and a No. 10 _____ to the right. Shut _____ B.

Answer to question No. 17. door

Slide No. 19. Schematic showing left side of dishwashing machine with doors A and B closed. Arrows pointing to place where curtains should be hung. Sign reading "Inside door C hang a No. 12 and a No. 10 curtain to the left. Shut door C."



Question used in booklet for Method II.

19. Inside door C hang a No. _____ curtain and a No. _____ curtain to the left. Shut _____ C.

Answer to question No. 18. curtain, curtain, door

Slide No. 20. Subject ready to get rinse dry bottle.

Question used in booklet for Method II.

20. Get rinse dry _____.

Answer to question No. 19. 10, 12, door

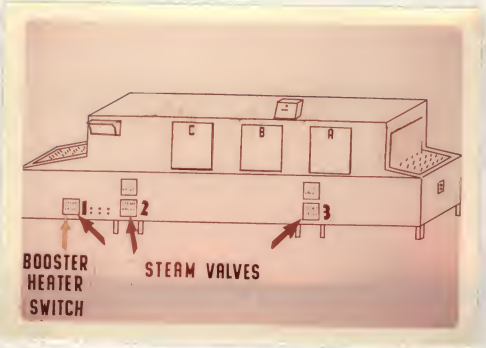
Slide No. 21. Subject in position to pour rinse dry in dispenser.

Question used in booklet for Method II.

21. Pour rinse dry in _____.

Answer to question No. 20. bottle

Slide No. 22. Schematic of left side of dishwashing machine with doors A, B, and C closed. Arrows pointing to three steam valves and booster heater switch.



Question used in booklet for Method II.

22. Location of _____ _____ switch and _____ valves.

Answer to question No. 21. dispenser

Slide No. 23. Subject's hands in position to turn on steam valve No. 1 with circle arrow pointing in direction valve should be turned.

Question used in booklet for Method II.

23. Turn on _____ valve No. 1.

Answer to question No. 22. booster heater steam

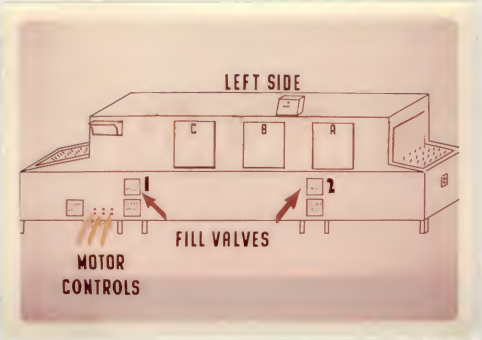
Slide No. 24. Picture of subject in position to turn on booster heater switch.

Question used in booklet for Method II.

24. Turn on _____ _____ switch.

Answer to question No. 23. steam

Slide No. 25. Schematic of left side of the dishwashing machine. Arrows pointing to three motor controls and two fill valves.



Question used in booklet for Method II.

25. Location of _____ _____ and _____ valves.

Answer to question No. 24. booster heater

Slide No. 26. Picture of subject's hands in position to push 3 motor start switches.

Question used in booklet for Method II.

26. Push _____ motor start switches.

Answer to question No. 25. motor controls fill

Slide No. 27. Picture of subject in position to turn off No. 1 fill valve. Circle arrow showing direction to turn steam valve.

Question used in booklet for Method II.

27. Turn _____ No. 1 fill valve.

Answer to question No. 26. 3

Slide No. 28. Picture of subject ready to turn on steam valve No. 2. Circle arrow showing direction to turn on steam valve.

Question used in booklet for Method II.

28. Turn on _____ _____ No. 2.

Answer to question No. 27. off

Slide No. 29. Picture of subject in position to turn off No. 2 fill valve. Circle arrow showing direction valve should be turned.

Question used in booklet for Method II.

29. Turn off _____ _____ No. 2.

Answer to question No. 28. steam valve

Slide No. 30. Subject in position to turn on steam valve No. 3.

Question used in booklet for Method II.

30. Turn on _____ _____ No. 3.

Answer to question No. 29. fill valve

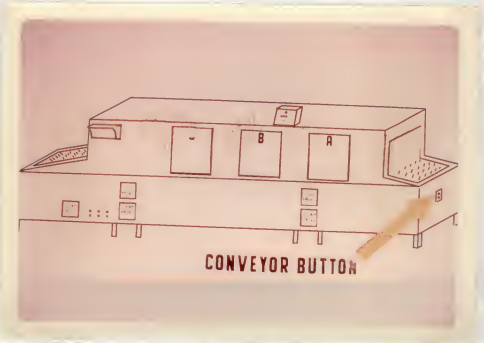
Slide No. 31. Subject ready to push detergent feed button.

Question used in booklet for Method II.

31. Push _____ feed button.

Answer to question No. 30. steam valve

Slide No. 32. Schematic of left side of dishwashing machine with arrow pointing to conveyor button.



Question used in booklet for Method II.

32. _____ button location.

Answer to question No. 31. detergent

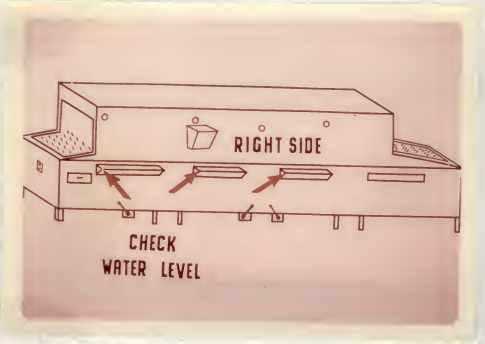
Slide No. 33. Picture of subject ready to push conveyor button on.

Question used in booklet of Method II.

33. Push conveyor button _____.

Answer to question No. 32. Conveyor

Slide No. 34. Schematic of right side of dishwashing machine with arrows showing where to check water level.



Question used in booklet of Method II.

34. Location of _____ _____ is on the _____ side.

Answer to question No. 33. on

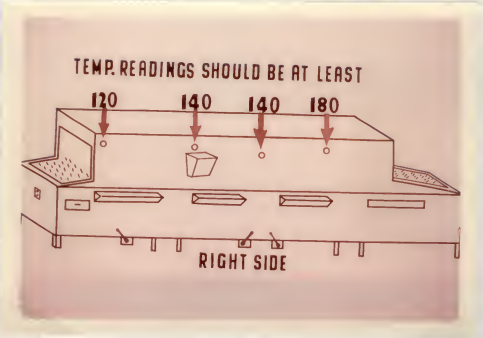
Slide No. 35. Subject and arrow pointing to height of water. All three levels should be about this high.

Question used in booklet of Method II.

35. All _____ _____ should be about this high.

Answer to question No. 34. water level right

Slide No. 36. Schematic of right side of dishwashing machine with arrows pointing to location of temp. gauges. At the end of each arrow is a temp. reading as follows: 120, 140, 140, and 180. Temp. reading should be about this high according to the sign.



Question used in booklet of Method II.

36. Temp. readings should be at least ____, ____, ____, and ____.

Answer to question No. 35. three levels

Slide No. 37. Subject's hands placing a rack of glasses into the loading end with sign reading, "Machine ready for use."

Question used in booklet of Method II.

37. Machine _____ for use.

Answer to question No. 36. 120, 140, 140, and 180

Answer to question No. 37. ready

APPENDIX B

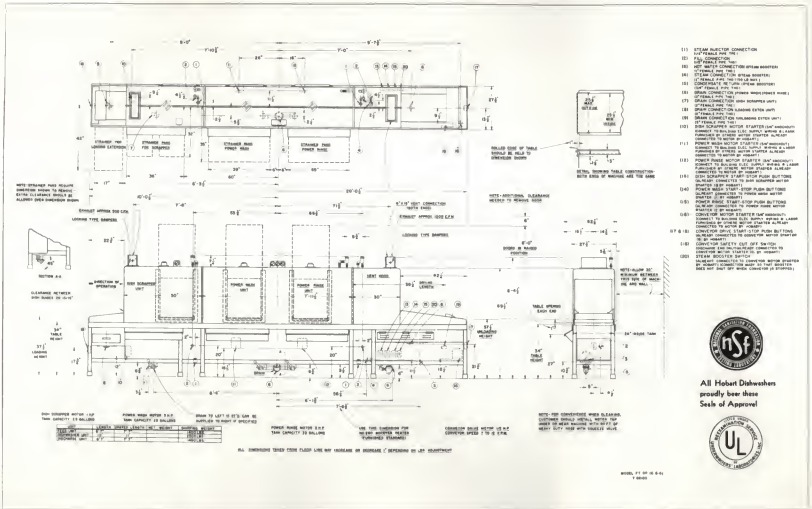
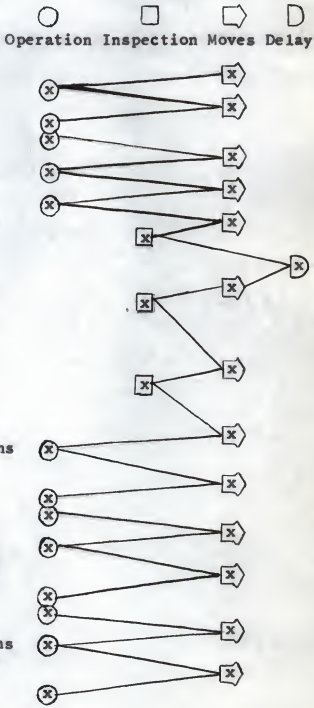


Fig. 1. Three-tank Hobart dishwashing machine used in training program.

PROCESS CHART

Present Method

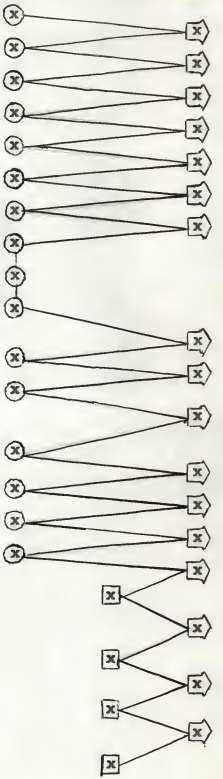
Dishwashing machine procedure, operation I, preparing the dishwashing machine for use.



PROCESS CHART, Present Method (cont.)

Operation Inspection Moves Delays

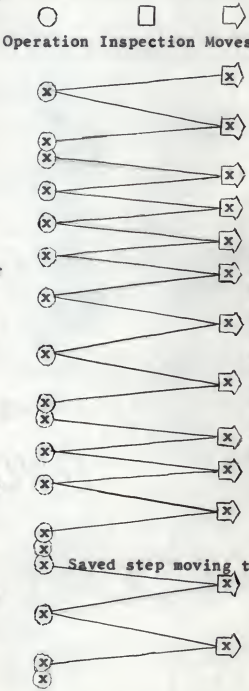
Hangs No. 10 curtain
Goes to steam valve No. 1
Turns on steam valve No. 1
Goes to steam valve No. 2
Turns on steam valve No. 2
Moves to steam valve No. 3
Turns on steam valve No. 3
Moves to door A
Closes door A
Moves to door B
Closes door B
Moves to door C
Closes door C
Goes to motor controls
Push motor control 1 (power rinse)
Push motor control 2 (power wash)
Push motor control 3 (dish scraper)
Go to detergent button
Push detergent button
Goes to detergent supply
Picks up 3 bags of detergent
Carries 3 bags of detergent to dispenser
Pour 3 bags of detergent into dispenser
Goes to rinse dry
Picks up rinse dry
Goes to rinse dry dispenser
Pours rinse dry in dispenser
Goes to conveyor button
Pushes on conveyor button
Goes to temp. gauge for rinse
Inspects to be sure temp. is 180°
Goes to power wash temp. gauge
Inspects to be sure temp. is 140°
Goes to wash temp. gauge
Inspects to be sure temp. is 140°
Goes to prewash temp. gauge
Inspects to be sure temp. is 120°



PROCESS CHART

Proposed Method

Dishwashing machine procedure, operation I, preparing the dishwashing machine for use.



PROCESS CHART, Proposed Method (cont.)

Operation	Inspection	Moves	Delays
Closes door C			Saved step moving to door C
Goes to rinse dry on cart			
Picks up rinse dry			
Moves with rinse dry to rinse dry dispenser			
Pours rinse dry in dispenser			
Carries rinse dry bottle back to cart			
Places rinse dry bottle on cart			
Goes to steam valve No. 1			
Turns on steam valve No. 1			
Turns on booster heater switch			Save move step to motor controls
Pushes motor control 1			
Pushes motor control 2			
Pushes motor control 3			
Moves to fill valve No. 1			
Turns off fill valve No. 1			
Turns on steam valve No. 2			Save move step to steam valve
Goes to fill valve No. 2			
Turns off fill valve No. 2			
Turns on steam valve No. 3			Save move step to steam valve
Stands up			
Pushes detergent button			
Goes to conveyor button			
Pushes on conveyor button			
Goes to water level check area No. 1			
Inspects water level			
Goes to water level check area No. 2			
Inspects water level			
Goes to water level check area No. 3			
Inspects water level			
Inspects water temp. gauge to make sure it is 180° for rinse			
Moves to check that water temp. power wash is 140°			
Inspects temp.			
Moves to check power wash No. 2 to be sure it is 140°			
Inspects temp.			
Moves to check prewash temp. to be sure it is 120°			
Inspects temp.			

Description of Slides for Training Employees in Preparing a Dishwashing Machine for Use

Slide No.

1. "Preparation of flight-type dishwashing machine for washing glassware, cutlery, and dishware."[a]
2. Schematic (drawing of dishwashing on slide) showing the left side of the dishwashing machine.
3. Actual picture of left side of the dishwashing machine and cart with curtains and with a bottle of rinse solution on it.
4. Schematic of right side of dishwashing machine with arrows pointing to location of 3 drain valves.
5. Subject in position to shut 3 drain valves.
6. Schematic of left side of dishwashing machine with arrows pointing to location of 2 fill valves.
7. Subject in position to turn on 2 fill valves with circle arrow pointing to direction valve should be turned.
8. Schematic of right side of dishwashing machine with arrows pointing to dispenser and detergent location.
9. Subject in position to get 3 bags detergent.
10. Subject ready to empty each bag in dispenser.
11. Schematic of cart with curtains on it near the left side of the dishwashing machine.
12. Subject in position to pick up No. 10 and 11 curtains.
13. Schematic of left side of dishwashing machine with arrow pointing to location of loading end. Sign reading hang curtains with numbers facing loading end.
14. Schematic of left side of dishwashing machine with arrows pointing to the location of hooks. Sign reading hang No. 10 and 11 curtains on hooks.

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[a]Procedure. Always try to show as much of the dishwashing machine as possible to give identification of area where subject is performing a task. Words used in actual slides are underlined.

Slide No.

15. Subject in position to hang shorter curtain farthest in.

16. Subject ready to hang longest curtain.

17. Subject in position to shut door A.

18. Schematic showing left side of dishwashing machine with door A closed. Arrows pointing to location where curtains should be hung. Sign reading inside door B hang a No. 10 curtain to the left and a No. 10 to the right. Shut door B.

19. Schematic showing left side of dishwashing machine with doors A and B closed. Arrows pointing to place where curtains should be hung. Sign reading inside door C hang a No. 12 and a No. 10 curtain to the left. Shut door C.

20. Subject ready to get rinse dry bottle.

21. Subject in position to pour rinse dry in dispenser.

22. Schematic of left side of dishwashing machine with doors A, B, and C closed. Arrows pointing to three steam valves and booster heater switch.

23. Subject's hands in position to turn on steam valve No. 1 with circle arrow pointing to direction valve should be turned.

24. Picture of subject in position to turn on booster heater switch.

25. Schematic of left side of the dishwashing machine. Arrows pointing to three motor controls and two fill valves.

26. Picture of subject's hands in position to push 3 motor start switches.

27. Picture of subject in position to turn off No. 1 fill valve. Circle arrow showing direction to turn steam valve.

28. Picture of subject ready to turn on steam valve No. 2. Circle arrow showing direction to turn on steam valve.

29. Picture of subject in position to turn off No. 2 fill valve. Circle arrow showing direction valve should be turned.

30. Subject in position to turn on steam valve No. 3. Circle arrow showing direction valve is to be turned.

Slide No.

31. Subject ready to push detergent feed button.

32. Schematic of left side of dishwashing machine with arrow pointing to conveyor button.

33. Picture of subject ready to push conveyor button on.

34. Schematic of right side of dishwashing machine with arrows showing where to check water level.

35. Subject and arrow pointing to height of water. All three levels should be about this high.

36. Schematic of right side of dishwashing machine with arrows pointing to location of temp. gauges. Sign states: temperature reading should be at least 120, 140, 140, and 180. Arrows point to desired temp.

37. Subject's hands placing a rack of glasses into the loading end with sign reading machine ready for use.

EVALUATION FOR INSTRUCTION PROGRAM

Method No. _____ Subject No. _____ Date _____

Instruction Program
Starting time _____
Program completed _____

Performance Evaluation
Starting time _____
Task completed _____

No. of errors made	Left out	Out of sequence	Could not find	Performed incorrectly
1. Close drain valve 1				
2. Close drain valve 2				
3. Close drain valve 3				
4. Open fill valve 1				
5. Open fill valve 2				
6. Empty detergent in dispenser				
7. Hang curtain 10				
8. Hang curtain 11				
9. Close door A				
10. Hang curtain 10				
11. Hang curtain 10				
12. Close door B				
13. Hang curtain 10				
14. Hang curtain 12				
15. Close door C				
16. Pour rinse dry in dispenser				
17. Turn on steam valve 1				
18. Turn on booster heater				
19. Turn on motor controls				
20. Turn off fill valve 1				
21. Turn on steam valve 2				
22. Turn off fill valve 2				
23. Turn on steam valve 3				
24. Push on detergent button				
25. Push on conveyor button				
26. Check water level				
27. Check 120° water temp.				
28. Check 140° water temp.				
29. Check 140° water temp.				
30. Check 180° water temp.				
Totals of four categories				
Total of all errors				

Comments:

Statements Made to Subjects at Beginning of Training

Method I. A slide program has been developed to show you how to set up a flight-type dishwashing machine. There are two kinds of slides: location and performance. For example, a location slide shows where drain valves are, and performance slide shows subject closing drain valves at the sign reading "Close drain valves." When you read this sign, you then go to the dishwashing machine and close the drain valves. Five minutes after completion of this program, you will set up the dishwashing machine without the aid of the slide program.

Method II. A slide program has been developed to show you how to set up a flight-type dishwashing machine. As you view each slide, fill in the missing words on the statements that have the same number as that on the slide projector case. Upon completion of this program you will set up the dishwashing machine without the aid of the slides or completed statements.

Key Points of Task
(Questions and Answers)

1. What is step No. 1?
   Answer: Shut 3 drain valves on the right side of the machine.

2. What is step No. 2?
   Answer: Turn on two fill valves located on the left side.

3. What is step No. 3?
   Answer: Empty 3 bags of detergent into detergent dispenser located on the right side of the machine.

4. What is step No. 4?
   Answer: Hang No. 10 and 11 curtains in front of machine, with shortest curtain farthest in.

5. What is step No. 5?
   Answer: Shut door A.

6. What is step No. 6?
   Answer: Inside door B hang a No. 10 curtain to the left and a No. 10 curtain to the right. Shut door B.

7. What is step No. 7?
   Answer: Inside door C hang a No. 12 and a No. 10 curtain to the left. Shut door C.

8. What is step No. 8?
   Answer: Pour rinse dry into rinse dry dispenser.

9. What is step No. 9?
   Answer: Turn on steam valve No. 1 on the left side of the dishwashing machine.

10. What is step No. 10?
    Answer: Turn on the booster heater switch.

11. What is step No. 11?
    Answer: Push motor start switches.

12. What is step No. 12?
    Answer: Turn off No. 1 fill valve.

13. What is step No. 13?
    Answer: Turn on No. 2 steam valve.

14. What is step No. 14?
    Answer: Turn off No. 2 fill valve.

15. What is step No. 15?
    Answer: Turn on steam valve No. 3.

16. What is step No. 16?
    Answer: Push detergent feed button.

17. What is step No. 17?
    Answer: Push on conveyor button.

18. What is step No. 18?
    Answer: Check water levels.

19. What is step No. 19? What should the temp. readings be?
    Answer: Check temperature gauges. At least 120^{o}, 140^{o}, 140^{o}, and 180^{o}.

20. Are there any more steps?
    Answer: No, machine is ready for use.

EVALUATION OF TWO VISUAL PRESENTATIONS OF A TRAINING PROGRAM FOR FOOD SERVICE WORKERS

by

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B. S., Rochester Institute of Technology
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AN ABSTRACT OF A MASTER'S THESIS

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Increased labor costs, expanded use of unskilled employees, and relatively low productivity have pinpointed the need for improved training methods in the food service industry. The effectiveness of programmed instruction as a training device in other industries has led to consideration of its use in training food service workers.

The purpose of this study was to develop two visual instruction methods for training employees in one phase of a machine dishwashing procedure and to evaluate and compare the two methods. Dishwashing was chosen because it is one of the most time-consuming operations performed in the institutional kitchen and is usually performed by unskilled employees.

A slide program of 35 mm color slides with step-by-step instructions for preparing a flight-type dishwashing machine for use was developed. This program was presented on an automatic slide projector by two methods. In method I, instruction was given in the dishroom, which gave the subject the opportunity to see the machine and try out each step while viewing the slides. Subjects in method II were instructed in a room away from the machine, and instead of trying out each procedure on the machine, wrote answers to questions in a booklet.

Twenty subjects from the K-State Union food service at Kansas State University were selected for instruction, 10 of which were instructed by method I and 10 by method II. Subjects of both methods were tested five minutes after instruction. Three criteria for measuring effectiveness were instruction time, test time, and number of errors.

Method I was significantly better at the 5% level than method II for both errors and test time, but there was no significant difference in instruction time. Employee attitudes were favorable toward programmed instruction in both method I and method II presentations.

Method II was more self instructional than method I, which required an instructor's presence to prevent injury to subjects or damage to equipment. It can be concluded that, although method I presentation was significantly better than method II in some aspects, method II also had advantages over method I. Both presentations of programmed instruction would be applicable to training of food service personnel.